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INVASION OF FRESHLY CUT DOUGLAS-FIR STUMPS BY *PORIA WEIRII*

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ABSTRACT

Poria weirii *spore inoculum failed to penetrate Douglas-fir stumps, but vegetative inoculum of the fungus readily colonized up to 75 percent of stumps, exceeding 12 inches in 1 year in sapwood but slower in heartwood.*

Keywords: Stumps, Douglas-fir, *Poria weirii*, root disease.

INTRODUCTION

Poria weirii (Murr.) Murr. causes a root disease of northwestern conifers much like that caused by *Fomes annosus* (Fr.) Cooke throughout temperate coniferous forests of the world. The two fungi are strikingly similar in vegetative spread and disease symptoms; but, unlike that of *F. annosus*, aerial spread of *P. weirii* by basidiospores has not been considered important in management practice. Wright and Isaac[1/] have shown that *P. weirii* can infect trunk wounds on conifers. If stumps can also be infected, even at a low frequency, the already

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1/ Ernest Wright and Leo A. Isaac. Decay following logging injury to western hemlock, Sitka spruce, and true firs. U.S. Dep. Agr. Tech. Bull. 1148, 34 p., 1956. Washington, D.C.

significant *P. weirii* disease problem could be multiplied manyfold by stand thinning. In 1967, we began a continuing study to determine the vulnerability of stumps to invasion by *P. weirii*.

METHODS

1967--Spores were collected in the woods on paper beneath *P. weirii* fruiting bodies occurring in unusual abundance that season. Vegetative inoculum was grown aseptically on autoclaved red alder (*Alnus rubra* Bong.) chips in 1-liter beakers for approximately 6 months. The intent was to cut selected trees and inoculate the stumps immediately. However, inoculations were delayed by a woods closure during a period of extreme fire danger when tree falling was not permitted. When rains finally ended the closure, spore discharge from the fruiting bodies had stopped and viability of basidiospores collected earlier was doubtful. Vegetative inoculum, however, remained in excellent condition.

Trees were selected for cutting in a young Douglas-fir stand on the basis of spacing, form, and size. Each tree was rated for crown class and crown condition (i.e., color, needle complement, and general appearance). All selected trees were between 4.2 and 8.3 inches in diameter at 16-inch stump height.

To simplify inoculation of fresh stumps and to assure uniformity of stump surfaces, trees were first felled at 3- to 4-foot stump heights 1 or 2 days prior to inoculation. Immediately before inoculation, stumps were shortened to 16 inches by sawing straight across the diameter with a chain saw to produce uniform, fresh, stump surfaces. Only stumps without obvious stain or decay (105 in all) were used in the study.

Each of five treatments was applied to 21 randomly selected stumps on October 5: (1) spores were applied to the stump surface and the stump covered with heavy, white paper; (2) spores were applied and left uncovered; (3) mycelium in alder chips was applied to the stump surface and covered with paper; (4) mycelium in chips was applied and covered only with cheesecloth; and (5) nothing was applied to stumps (control).

In treatments 1 and 2, approximately 9 million spores in water suspension were applied to each stump. In treatments 3 and 4, about 1 liter of *P. weirii* mycelium in alder chips was spread over the surface of each stump and held in place with cheesecloth. In treatments 1 and 3, stumps were tightly covered with heavy white paper, which in laboratory tests reduced moisture loss by about 50 percent.

Two sheltered hygrothermographs were set at stump height at representative points on the thinned area to measure temperature and humidity. During the following 6 weeks, humidity was generally high, reaching 100 percent most nights. Temperatures varied between 40° and 66° F.

Six, 12, and 18 months after inoculations, the upper 12 inches of seven stumps in each of the five treatments were sawn off, brought into the laboratory, and split down the center. Half of each stump was loosely covered with plastic sheets and incubated in a walk-in cooler at 45° F. Relative humidity in this cooler was not controlled but normally ranges between 90 and 100 percent. After 10 to 14 days, the half-sections were examined for surface growth of *P. weirii* mycelium. From the middle of the other half, a slab 1 inch thick was sawn longitudinally and split aseptically at points one-third and two-thirds of the distance from the pith to the outer edge. Chips taken at 1-inch intervals along the split surfaces were cultured onto malt agar-streptomycin slants.

1968--Inoculations were not made because sporophores did not develop in the woods, probably a result of lower than normal average daily temperatures and much higher than normal precipitation during the study period.

1969--To insure badidiospore inoculum, in midsummer we brought *Poria*-decayed logs into the greenhouse where sporophore formation took place.

Spore inoculum was collected daily on cellophane disks and on petri plates placed beneath the sporophores. Spore viability approached 100 percent. Vegetative inoculum was identical to that described earlier.

Trees were selected and treated in the same manner as in 1967. In all, 85 trees were thinned to provide stumps for the 1969 study. Five of these were inoculated by placing sporophores on a wire rack a few centimeters above each stump surface. The inoculated stumps were then wrapped with heavy paper held around the stump with string. The remaining 80 stumps were randomly assigned to the following four treatments: (1) stumps without inoculation covered with heavy paper (checks), (2) stumps inoculated with spores by placing the cellophane disk inverted on the stump surface and covering the stump with paper, (3) stumps inoculated with spores on a water-agar disk[2/] by placing the disk spore side down on the stump surface, and (4) stumps inoculated with chips supporting vegetative hyphae of *P. weirii* and covered with heavy paper. Inoculations were made September 26-28.

Hygrothermograph records again indicated humidity (near 100 percent) and temperature (45°-65° F.) conditions at stump height favorable for germination of basidiospores for nearly 2 weeks following inoculations and for most of the succeeding 2-week period after which records were no longer kept.

[2/] Spores collected on petri plates were covered with cool water agar. When the agar jelled, the disks, with most of the spores on the lower agar surface, were removed.

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